

# Pneumonia in bighorns and disease transmission



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# What causes bighorn sheep pneumonia?

- Multiple theories over the past 50 years
  - Lungworms
  - *Mannheimia haemolytica*
- *Mycoplasma ovipneumoniae* (Movi)
  - Emerging Infectious Diseases 18(3):406, 2012

“*M. ovipneumoniae* plays a primary role in the etiology of epizootic pneumonia of bighorn sheep”

# Bighorn sheep pneumonia

- Movi infects and invades the lungs
- Movi infection blocks mucociliary clearance (responsible for expelling inhaled bacteria)
- Inhaled bacteria result in simultaneous infections with many different bacteria, resulting in disease and death

# Persistent carriers cause lamb pneumonia outbreaks

- Some bighorn sheep that survive pneumonia continue to carry Movi in nasal mucus (chronic carriers)
- Chronic carriers transmit Movi to lambs, causing lamb outbreaks that may recur for decades
  - For example, Umtanum and Selah Butte since the 2009 Yakima Canyon outbreak

# Evidence linking Movi to bighorn pneumonia

- Movi detected in every bighorn pneumonia outbreak investigated to date (40+)
- Movi not present in 90%+ of healthy bighorn herds (30+)
- In previously Movi-negative bighorn herds, Movi exposure coincides with the outbreak
  - For example, Tieton

## Transmission of *M. ovipneumoniae*

- Track by DNA ‘fingerprinting’
- General rules in bighorn sheep pneumonia:
  - One outbreak = one fingerprint
    - For example, Umtanum = Selah Butte
  - Different outbreaks = different fingerprints
    - For example, Tieton differed from Umtanum, Selah Butte

# Transmission of *M. ovipneumoniae*

- Within outbreaks
  - Movi infection rate ~100%, one fingerprint
  - In recurrent lamb pneumonia, fingerprint matches that of the preceding all-age outbreak
    - For example, 2015 Umtanum lamb strain matches the 2009 Umtanum strain fingerprint
- Across bighorn sheep metapopulations
  - Relatively slow and inefficient
  - Presumed due to chronic carrier animal movements



Hells Canyon ID OR WA

95: BB

96: LHC, MV, RB

00: BC, IM, SM, UHC

01: MU, WE

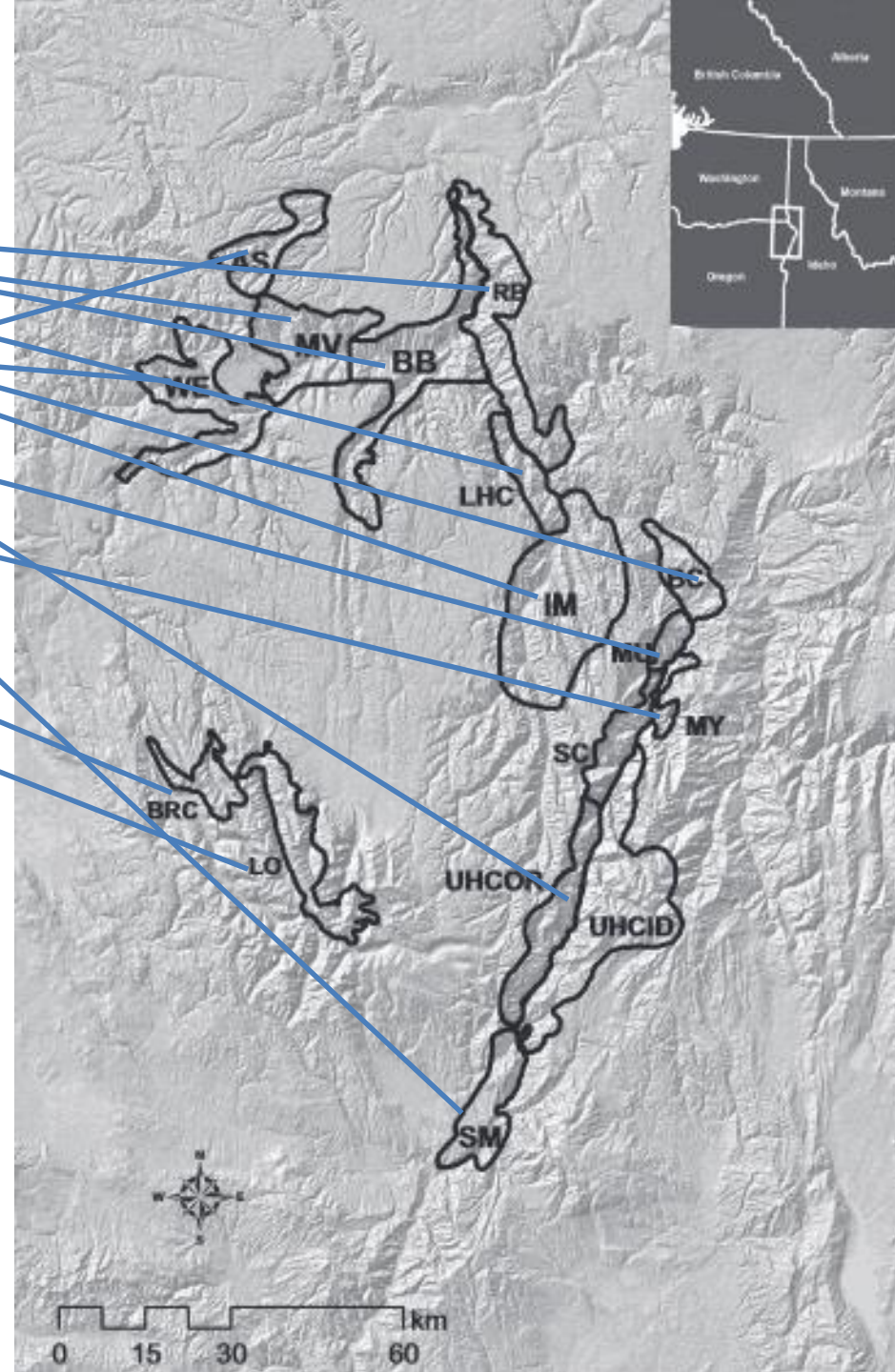
02: MY

03: BRC

08: LO

12: AS

Spread of Movi 404  
across Hells Canyon  
bighorn populations





## Sources of *M. ovipneumoniae*?

- Movi doesn't persist in the environment, requires animal carrier source
- Movi host range: sheep and goat species
  - rare unconfirmed reports from other species
- Domestic sheep and goats are Movi reservoirs
  - Movi present in ~90% herds / flocks
  - Single flocks carry multiple fingerprints
  - 'Endemic' (disease rare, carriage common)
- Bighorn sheep comingled with Movi-carrier domestic sheep develop lethal pneumonia

## Summary: Bighorn sheep pneumonia

- Movi is the primary cause
- Movi transmission may be fast and efficient...
  - For example, sick or coughing animal sources
- ... or slow and inefficient
  - For example, chronic carrier animal sources
- Movi sources causing bighorn outbreaks:
  - Within metapopulations, contact with carrier bighorn sheep
  - Otherwise, contact with carrier domestic sheep or goats

# Acknowledgments

The background of the slide is a photograph of two bighorn sheep on a steep, rocky mountain slope. One sheep is on the left, facing right, and the other is on the right, facing left. They are both looking towards the camera. The terrain is rugged with dark rocks and some sparse vegetation.

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